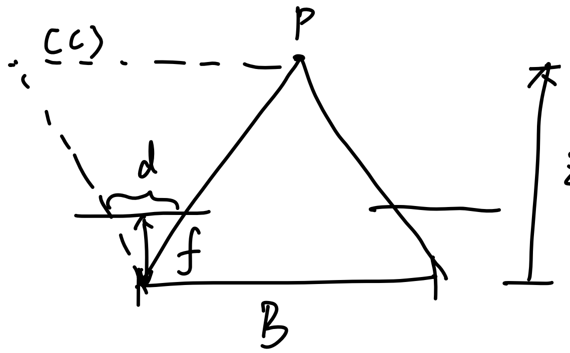
22-S1-Q5

Q(a) 不考

(b) 不考

(c)



Solution

$$\frac{f}{z} = \frac{d}{B} \Rightarrow z = \frac{fB}{d}$$

$$\hat{d} = d + \Delta d$$

$$\hat{z} = \frac{fB}{\hat{d}} = \frac{fB}{d+\Delta d}$$

$$\Delta z = \hat{z} - z = \frac{fB}{d+\Delta d} - \frac{fB}{d}$$

Taylor approximation: Δd is small

$$\frac{1}{d+\Delta d} \approx \frac{1}{d} - \frac{\Delta d}{d^2}$$

$$\Delta Z = \left(\frac{fB}{d} - \frac{fB\Delta d}{d^2}\right) - \frac{fB}{d} = -\frac{fB}{d^2}\Delta d$$

$$\Delta Z = -Z\left(\frac{\Delta d}{d}\right)$$

(d) ① $I(x,y,t) = I(x+u, y+v, t+1)$

$$= I(x,y,t) + I_x u + I_y v + I_t$$

$$I_x u + I_y v + I_t = 0$$

② limitation — ref PPT P37

① The component of the motion perpendicular to the gradient (i.e., parellel to the edge) cannot be measured

② fails under varying lighting

③ doesn't accout sepcular reflection or shadows

④ only accurate for small displacement

③ other key assumptions

flow field is smooth

lambertian Surface

Temporal consistency

④ math 不考